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Controlling compaction: Do's and don'ts

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Farming is ever-changing and improvements to perform timely field operations can impact soil health. Larger, road-ready trucks and equipment with higher tire pressures and larger axle loads made to spread manure, plant, spray and harvest quicker can cause severe soil compaction. Predicted wetter seasons and the need to maximize crop yields and forage quality increases the time pressure for field operations.

Compaction by field operations during wet conditions (if you can form a ball of soil in your hand it is prone to excessive compaction) reduces the soil pore sizes and interconnectivity of the soil pores. This will:

• Reduce crop yield potential by impeding root growth and limiting the volume of soil explored by roots, thus decreasing the ability of crops to take up nutrients and water efficiently from soil.

• Increase the potential for water runoff and soil erosion.

During dry seasons, this will:

• Reduce crop yield potential by limiting water infiltration rates and lowering available water in the soil.

Photo courtesy of Joe Lawrence.

Variable weather patterns add to the challenge of capturing high-quality forages.

During wet seasons, this will:

• Reduce crop yield potential by water logging the soil, limiting aeration and slowing soil warming.

• Increase the potential for water ponding on the surface.

Preventing soil compaction needs to be considered when devising your agronomic system. Plan cropping systems, including crop rotations, tillage methods and equipment, used to minimize compaction.

DO:

• Investigate your soils to determine the extent of compaction damage:
  - Look for damage from areas with high traffic, ponding, low yields or erosion.
  - Dig holes to look for limited or horizontal root development.

Continued on back

- Understand the differences between surface and subsurface compaction layers.

• Use a soil health indicator to continually monitor physical and biological characteristics.

• Plan rotations to include a variety of fibrous and tap rooted crops.

• Utilize cover crops that provide rooting systems that will mature.

• Minimize tillage operations.

• Limit field work during wet conditions where possible until soil (even subsoil) is friable.

• Limit axle weight to less than 10 tons and tire pressures to less than 35 psi for field equipment.

• Long-term items to consider:
- Investigate practices that allow your farm to move to more reduced and no-till practices.
- Use precision agriculture to define traffic lanes.
- Install drainage systems.
- Develop the capacity (with your equipment and/or custom operations) to perform field operations quickly enough after waiting for friable soil conditions.

DON'T:

• Ignore the impacts of compaction when operating on wet fields.

• Spread traffic out: 90 percent of compaction damage can occur on the first pass.

• Use road trucks in fields (or limit them to headlands or defined paths).

• Arbitrarily deep till without determining the depth needed (at least an inch below the compacted layer) and without waiting for dry conditions.

• Count on frost to repair compaction damage.

Soil health is vital to obtain consistent high yields. A number of commercial soil tests are available to help assess soil health. These can be valuable tools to develop a strategy to control compaction; however, when choosing a soil health assessment tool, be sure to review the results the test will provide and ask if the results will help point to actionable remediation/improvement strategies. The physical and biological properties relating to compaction include: soil texture, bulk density, available water capacity (relates to soil pore size), aggregate stability, surface and subsurface hardness (use a penetrometer if available) and organic matter content.

Minimizing tillage to increase soil cover and reduce field operations can have significant benefits to control compaction. Limiting the number of times that fields are trafficked by reducing tillage can significantly reduce compaction. Continued deep tillage can create a plow pan just below the tillage implement that resists root penetration. Residue on the surface may help support wheel loads.

Crop rotations that include alfalfa, sorghum and cereal cover crops encourage root development to both break up the soil but also to increase organic matter and improve aggregate stability. These are an important part of an agronomic strategy to limit compaction impacts.

To provide the forage needs of your dairy animals, dependable high yields of quality forages are vital. Don't let compaction limit the productivity of your crop fields. ▮

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